COVER LETTER

TO: Supervisor, Idaho Panhandle National Forest's

On July 13, Sandy Gast, entomologist at our Coeur d'Alene field office, met with Pat Shira on the Bonners Ferry Ranger District to investigate the cause of ponderosa pine fading. Her observations and recommendations are included in the enclosed trip report.

If we can be of further assistance, please contact us.

Sincerely,

DAVID M. SPORES
Director
Timber, Cooperative Forestry, and Pest Management

TRIP REPORT -- FADING PONDEROSA PINE
Bonners Ferry Ranger District, Idaho Panhandle National Forests
July 13, 1992

On July 13, 1992, I met Pat Shira on the Bonners Ferry Ranger District to investigate the possibility of a western pine beetle, Dendroctonus brevicomis, problem in 2 sale areas in the Meadow Creek area. Western pine beetle activity occurred there in the past and current fading was noted in ponderosa pine this spring. We visited the Orser Creek sale area and 2 stands in the ComPlacerC sale area.

Much of the ponderosa pine fading throughout these areas this spring was due to needle diseases. Since then, new foliage has grown out of the buds and the trees appear much greener. Needle diseases normally do not kill trees outright and only affect one year's growth of needles. Some complete crown fading occurred in ponderosa pine and lodgepole pine in the 2 sale areas which I will address separately.

Orser Creek Sale

Some dead ponderosa pine were observed with mortality contributed to the western pine beetle but these trees had been killed a few years ago. No current mortality contributed to the beetle was noted. One ponderosa pine, about 14 inches in diameter, with a currently fading red crown, was observed but no bark beetles were found on the bole. However, white mycelial fans due to armillaria root disease were found growing from the roots to 6 feet up the bole. Ponderosa pine is normally resistant to root disease after about age 20. We didn't see distinct root rot "pockets" or a lot of mortality but due to the size of the fans in a relatively resistant species, the armillaria appears to be aggressive. The stand is composed of 45% PP, 40% DF, and 10% WP. Douglas-fir is the most susceptible species to armillaria root disease but no

symptoms were currently found in this species. The stand is scheduled for a shelterwood harvest. Any time a partial cut is done in a stand with root disease, additional mortality can be expected in the leave trees (see armillaria root disease biology and management below).

ComPlacerC Sale

Stand 739-03-10-- Several ponderosa pine in this stand had been killed in years past by western pine beetles. Some of the dead ponderosa pine, however, had no evidence of bark beetles. In most of the dead trees we found old armillaria fans. The dead ponderosa pine were located in a "pocket" or group typical to that found with root disease. This stand is composed of 27% LPP, 42% DF, 14% WL, and 13% PP and is scheduled for a sanitation salvage thinning. Again, Douglas-fir is the most susceptible species. No current active armillaria was found but any kind of partial cutting may increase the amount of root disease activity.

Stand 739-03-01-- One currently fading lodgepole pine was found with no bark beetles but had active armillaria root disease. Mountain pine beetle, Dendroctonus ponderosae, activity was noted on the stand exam. This stand is scheduled for a salvage cut removing the beetle infested trees. Other species in the stand include Douglas-fir and ponderosa pine. Partial cutting may increase the amount of root disease activity in the remaining trees.

In general, the partial cutting planned for these areas may increase mortality in the remaining trees. If a more detailed analysis needs to be done, I suggest consultation with Bob James or John Schwandt, plant pathologists at the Coeur d'Alene field office.

ARMILLARIA ROOT DISEASE

Hosts

All conifers in the Region. Primary hosts are Douglas-fir and true firs. Lodgepole pine and ponderosa pine are moderately susceptible.

Damage

Causes mortality in centers and in individual scattered trees. Infected trees are often attacked by bark beetles.

Life History

The fungus commonly invades stressed trees or those infected with other root pathogens. It survives on dead organic matter such as old stumps and roots and spreads from these food bases to the roots of live trees either through direct root contact or by rhizomorphs. From infected roots, the fungus colonizes the root collar, kills the cambium, and eventually girdles the tree. Honey-colored mushrooms may be produced at the base of infected trees during late summer or early autumn. The role of spores from these mushrooms in desease development is unknown. The fungus can survive saprophytically within dead wood material on a site for several decades.

Identification

Crowns of trees infected with armillaria are often chlorotic with thinning from the bottom up and inside out, and show reduced shoot growth. Diseased trees may also produce stress cone crops, although much of the seed produced is not viable. Crown symptoms are relative and comparisons should be made with adjacent healthy trees. The fungus produces large white mycelial fans under the bark and causes extensive resinosis at the root collar of infected trees. Other signs of the fungus include rhizomorphs on the outside of infected roots and honey-colored mushrooms. The decay is a white to yellowish stringy rot that may be accompanied by fine, black zone lines.

Management

Root diseases are caused by fungi that spread from the roots of diseased trees to those of healthy ones. Spread may be through root grafts, root contact, or short distance growth of the fungus through the soil. Tree-to-tree spread results in enlarging "pockets" or centers of dead and dying trees. The radius of a center increases at an average rate of about 1-2 feet per year in fully stocked stands of susceptible species. Still, the area occupied by root disease in a stand can double every 10 years.

Only about half of the root disease infected trees can be detected by above-ground symptoms at any given time. It may take several years for a tree to develop crown symptoms following infection. Trees may die within 1 year after they develop symptoms, or they may live several more years. Larger declining trees are often attacked and killed by bark beetles.

Tree cutting can intensify root disease. Disease intensification in cutover stands appears to be due to the rapid colonization of the stumps and roots after infected trees are cut. Infested stumps then serve as effective food bases for the pathogens enabling them to infect and kill other nearby trees.

Silvicultural systems

In general, the most appropriate regeneration systems are those that favor disease-tolerant species and minimize pathogen buildup. These tend to be systems that favor seral species, i.e., clearcutting, patch cutting, and seed tree cutting. Sanitation-salvage and other forms of partial cutting can increase pathogen buildup. Partial cutting also favors shade-tolerant species that are most susceptible to the root diseases, i.e., Douglas-fir and true firs. Overstory removal, when it removes the tolerant overstory trees from root-disease susceptible regeneration, is also discouraged. A seed tree cut or clearcut that includes site preparation and species conversion is more appropriate.

Planting

Seedlings are commonly planted in the shade of stumps to increase early survival. This is not a good practice where stumps are infested with root pathogens, as most susceptible trees will die within 1 or 2 decades. Any conifer species may be killed at an early age by armillaria.

Commercial thinning

An unacceptable amount of tree mortality and windthrow has occurred in thinned stands in many locations. The rates of mortality have not been measured, but many dead and dying trees were present in some stands within only 3-5 years following thinnings that left only desirable, full-crowned trees. It appears that thinning accelerates mortality rates.

Not all stands undergo severe losses following commercial thinning, and we lack the ability to predict where losses will and won't occur. Nevertheless, it seems expedient to defer treatment, or omit commercial thinnings altogether, in stands that are heavy to Douglas-fir and/or grand fir and have at least a moderate amount of Armillaria or Phellinus root disease.

Sanitation-salvage

Sanitation or sanitation-salvage cutting captures mortality that would otherwise be lost. However, such cutting, like commercial thinning, can increase mortality. Sanitaiton cutting is at best a short-term holding action used to buy time until a regeneration cut can be made.

Sandy Gast
Entomologist
Timber, Cooperative Forestry and Pest Management
Coeur d'Alene Field Office